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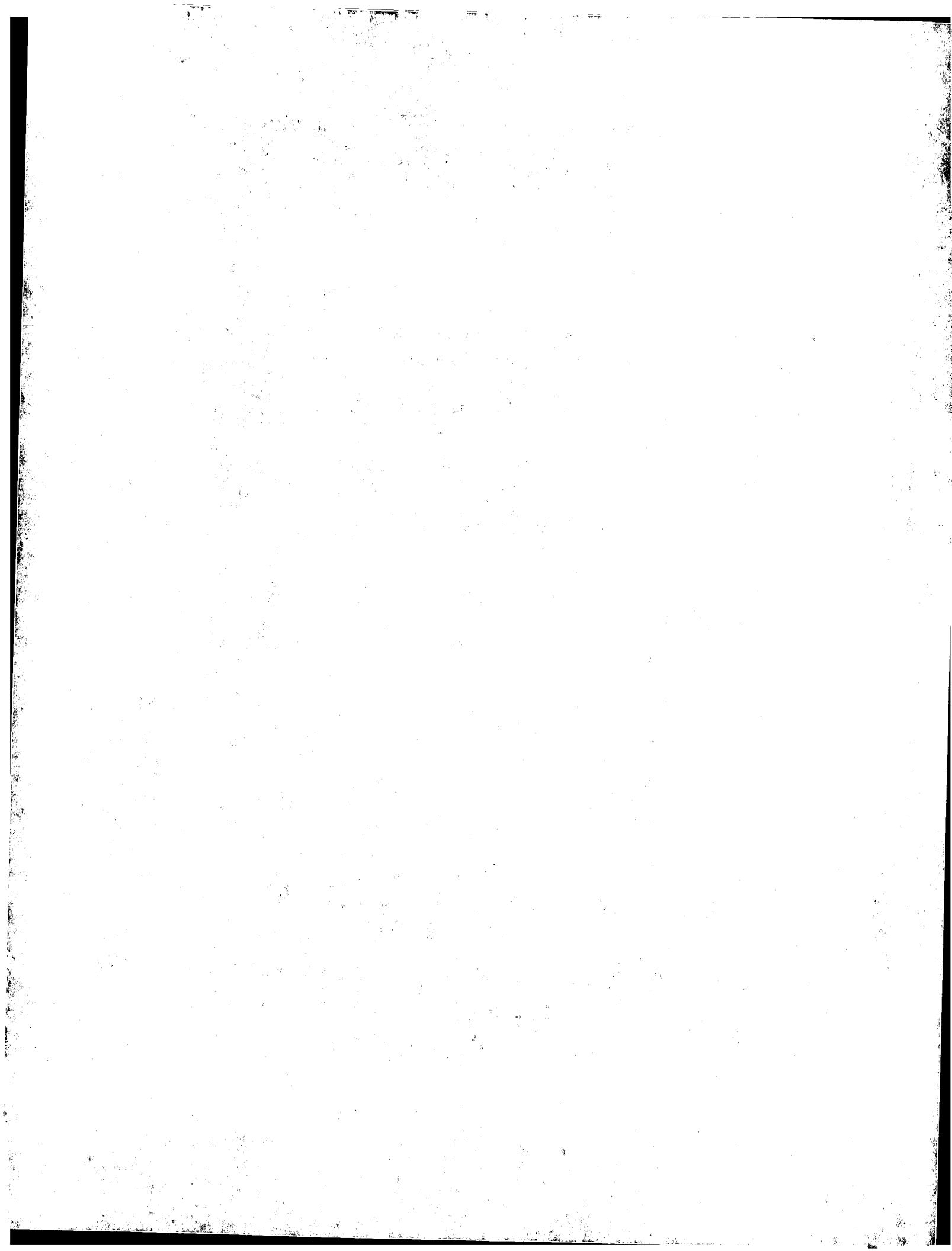
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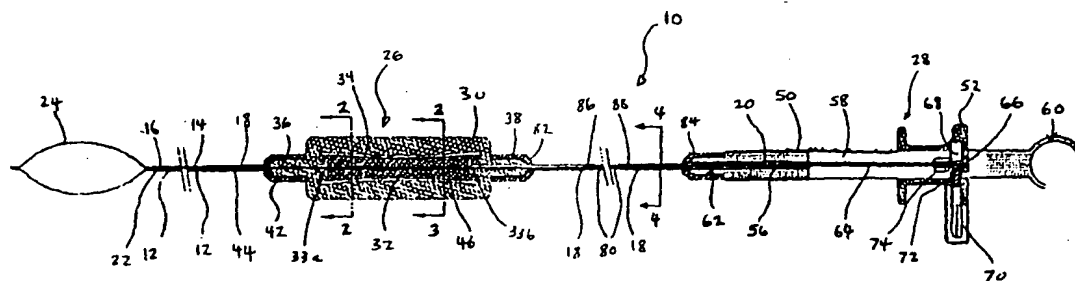
(43) International Publication Date  
15 February 2001 (15.02.2001)

PCT

(10) International Publication Number  
**WO 01/10321 A1**

- (51) International Patent Classification<sup>7</sup>: **A61B 18/18**
- (21) International Application Number: **PCT/US00/21411**
- (22) International Filing Date: **7 August 2000 (07.08.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:  
09/369,724                      6 August 1999 (06.08.1999)    **US**
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- (81) Designated States (*national*): **CA, JP.**
- (84) Designated States (*regional*): **European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).**
- Published:**  
— *With international search report.*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: **POLYPECTOMY SNARE INSTRUMENT**



(57) Abstract: A surgical snare instrument includes a first handle (26) capable of controlling the rotational position of the snare (24), and a second handle (28) adapted to control the opening and closing of the snare (24) and cauterization. The first handle (26) serves as a grippable element on the sheath (12) and contains a system which rotates the shaft (18), and consequently the snare (24), so that when the physician grips the first handle (26), the physician is capable of steering the snare (24) by operating the first handle (26). In addition, the physician is also capable of positioning the entire sheath (12) relative to the endoscope by sliding the sheath (12) into and out of the working channel of the endoscope.

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1 sheath begins to extend out of the distal end of the endoscope.  
2 The physician then directs an assistant, who has control of the  
3 handle of the snare instrument, to open the snare. The assistant  
4 accomplishes this function by moving two portions of the handle  
5 relative to each other. The physician then advances and retracts  
6 the sheath into and out of the endoscope, while applying torque to  
7 some portion of the instrument to position the snare loop over and  
8 around a polyp. Once the snare loop is positioned around the  
9 polyp, the physician orders the assistant to close the snare  
10 around the polyp. Then, the physician or assistant energizes a  
11 source of electrocautery current coupled to the shaft to  
12 desiccate, sever, and cauterize the polyp. Finally, the polyp is  
13 removed by withdrawing the snare (or, in some cases, the polyp is  
14 retrieved by use of another instrument such as a biopsy forceps).  
15 In a variation of the procedure, the physician uses suction  
16 applied to a channel of the endoscope to remove the polyp or to  
17 hold it to the end of the endoscope.

18

19 Prior art snare instruments have several problems. First, it  
20 is difficult for the physician to precisely position the snare  
21 because the physician relies on gripping the small, slippery  
22 sheath over the shaft near where the sheath enters the endoscope  
23 handle. Typically, it is necessary for the physician to  
24 repeatedly push, pull, and torque the sheath and the shaft of the  
25 instrument in order to achieve the desired position with the snare

1 assistant to coordinate the handle controls while the physician  
2 moves the jacket in and out of the endoscope. As a result, these  
3 instruments have not been widely accepted by physicians.

4  
5 SUMMARY OF THE INVENTION  
6

7 It is therefore an object of the invention to provide a snare  
8 instrument which permits the physician to control all aspects of  
9 positioning the snare loop relative to the polyp, while allowing  
10 the assistant to perform the cauterizing and severing of the  
11 polyp.

12

13 It is a further object of the invention to provide a snare  
14 instrument which provides to the physician the means for advancing  
15 and retracting the distal end of the snare instrument through the  
16 endoscope, as well as rotating the snare, and which provides to  
17 the assistant the means for extending and retracting the snare  
18 loop from the sheath of the snare instrument.

19

20 It is another object of the invention to provide a snare  
21 instrument in which the physician has direct and immediate control  
22 of the entire instrument.

23

1 the sheath is adjacent to the distal end of an endoscope. The  
2 physician's handle serves as a grippable element on the sheath and  
3 contains a rotating means for rotating the shaft, so that when the  
4 physician grips that handle the physician is capable of steering  
5 (rotating) the snare by operating the rotating means. In  
6 addition, the physician is also capable of positioning the entire  
7 sheath relative to the endoscope by sliding the sheath into and  
8 out of the working channel of the endoscope. The proximal handle  
9 is operable by an assistant and permits longitudinal movement of  
10 the shaft and snare and the application of a cautery current to  
11 the shaft and snare.

12  
13 According to other embodiments, the snare instrument is  
14 provided with a connector which enables the snare instrument to be  
15 fixed relative to an endoscope handle. Additionally, an  
16 embodiment is also provided in which a single handle provides a  
17 physician with means for advancing and retracting the sheath of  
18 the snare instrument relative to the distal end of the endoscope,  
19 means for advancing (opening) and retracting (closing) the snare  
20 relative to the distal end of the sheath, and means for steering  
21 (rotating) the snare to position the snare over a polyp. Since  
22 the physician has direct and immediate control of the entire  
23 instrument, the snare instrument obviates the need for an  
24 assistant during the procedure, and improves the speed and  
25 efficiency of the polypectomy procedure.

1        Fig. 7 is an enlarged cross-section through line 7-7 in  
2        Fig. 5, at a location proximal of the key;

3  
4        Fig. 8 is a broken section view of a third embodiment of the  
5        snare instrument according to the invention;

6  
7        Fig. 9 is an enlargement of the area between lines 9a-9a and  
8        9b-9b in Fig. 8;

9  
10       Fig. 10 is a broken section view of a fourth embodiment of  
11       the snare instrument of the invention; and

12  
13       Fig. 11 is a broken section view of a fifth embodiment of the  
14       snare instrument of the invention.

15  
16       DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

17  
18       Turning now to Fig. 1, a first embodiment of a surgical snare  
19       instrument 10 according to the invention is shown. The snare  
20       instrument 10 includes an elongate flexible tubular sheath 12  
21       having a proximal end 14 and a distal end 16, a flexible shaft 18  
22       having a proximal end 20 and a distal end 22 extending through and  
23       axially movable relative to the sheath 12, a snare 24 coupled to  
24       or formed at the distal end 22 of the shaft 18, preferably  
25       adjacent the distal end 16 of the sheath 12, and first and second

1 The apertures 35 provide access to the knob 32, so that the knob  
2 32 can be rotated relative to the body 30, e.g., by a physician.

3  
4 A portion of the shaft 18 extending through the bore 40 of  
5 the knob 32 is provided with a key 46; that is, a spline element  
6 fixed on and about the shaft 18 or, alternatively, rigidly and  
7 fixedly interposed between two portions of the shaft. The key 46  
8 preferably has a rectangular shape but may have another non-  
9 circular shape. The key 46 is slidably axially movable within the  
10 bore 40. Therefore, the shaft 12 may be moved axially through the  
11 bore 40 (and that is why the length of the knob 32 is preferably  
12 at least as long as the distance of movement required to open and  
13 close the snare). However, when the knob 32 is rotated relative  
14 to the body 30, the key 46 within the bore 40 is rotated and,  
15 consequently, the shaft 18 and snare 24 are rotated relative to  
16 the sheath 12.

17  
18 The distal handle assembly 28 is preferably positioned  
19 approximately 210 cm from the distal end 16 of the sheath 12 for a  
20 snare instrument 10 designed to be inserted into a 200 cm  
21 endoscope. Thus, the physician can grip the body 30 in a manner  
22 which permits rotating the knob 32 relative to the body, and hence  
23 the snare 24 relative to the sheath 12, while using the body 30 as  
24 a grip to axially position the snare instrument 10 within the  
25 working channel of an endoscope.



1 Referring to Figs. 1 and 4, an electrically insulative  
2 extension sheath 80 extends over the shaft 18 between the proximal  
3 end 38 of the body 30 and the distal end 62 of the stationary  
4 member 50, coupled, e.g., via flare-nut connections 82, 84. Thus,  
5 there is a continuous outer connection joining, yet spacing apart,  
6 the distal handle assembly 26 and the proximal handle assembly 28.  
7 A stiffening sleeve 86 is preferably provided over the extension  
8 sheath 80 at the proximal end 38 of the body 30, and another  
9 stiffening sleeve 88 is preferably provided over the extension  
10 sheath 80 at the distal end 62 of the stationary member 50.

11  
12 In use, the physician introduces the snare instrument 10 into  
13 the endoscope (not shown), typically by means of a port in the  
14 endoscope handle which communicates with the working channel of  
15 the endoscope. Then, the physician gives the proximal assistant's  
16 handle 28 to the assistant. The physician then grips the body 30  
17 of the distal physician's handle 26 of the snare instrument and  
18 uses it to position the distal end 16 of the sheath 12 adjacent to  
19 the polyp to be excised. The physician then instructs the  
20 assistant to extend the snare, which is performed by moving the  
21 spool member 52 relative to the stationary member 50. The  
22 physician then uses the distal handle 26 to simultaneously axially  
23 position and rotate the snare over the polyp. Then, the physician  
24 instructs the assistant to close the snare and sever the polyp,  
25 using cautery if desired. In this manner, the physician controls

1 1.25 inches). It should be noted that if the key 146 has a  
2 substantial length (e.g., 0.75 inch), the body 130 and knob 132  
3 can be made even shorter, since it is necessary for only a portion  
4 of the key 146 to be engaged with the non-circular bore 140 of the  
5 knob shaft 192 at any time.

6  
7 In addition, while the first embodiment describes a shaft 18  
8 that is monolithic and continuous from the snare 24 to the  
9 proximal handle assembly 28, the shaft may alternatively be a  
10 composite structure. Specifically, referring to Figs. 8 and 9,  
11 according to a third embodiment of the invention, the  
12 straightened, torsionally-stiff, camber-free section of the shaft  
13 218 need only extend from the snare to the knob 232. A swivel  
14 joint 290 may be interposed on the shaft 218 between the knob 232  
15 and the proximal handle assembly, and join the shaft 218 to a  
16 flexible or stiff proximal shaft extension 292 which extends to  
17 the proximal handle assembly. The proximal end 294 of the shaft  
18 218 is preferably formed into an enlarged section, i.e., a head  
19 296, or a separate, enlarged head may be attached to the proximal  
20 end of the shaft. A swivel tube 298, preferably made of a  
21 malleable alloy, such as brass or stainless steel, is provided  
22 over the head 296. A distal end 299 of the swivel tube 298 is  
23 swaged or crimped to form a loose fit on the shaft 218, while  
24 being small enough to retain the head 296. The swivel tube 298 is  
25 placed onto the shaft 218 such that the head 296 is trapped inside

1 includes a coupling fitting 352 which is couplable to the port of  
2 the endoscope, and a connector 354 which is slidably movable, yet  
3 capable of being secured in a position, relative to the coupling  
4 fitting 352. The connector 354 has a proximal end 356 which is  
5 threadably coupled to the distal end 336 of the body 330.

6  
7 The coupling fitting 352 includes a cylindrical block 358  
8 having an axial bore 360, and a tubular nosepiece 362 secured in  
9 the axial bore 360. The connector 354 includes a stepped bore 364  
10 having a relatively large central portion 366, and relatively  
11 smaller proximal and distal portions 368, 370. The central  
12 portion 366 of the stepped bore 364 is sized to permit relative  
13 axial movement over the block 358. The distal portion 370 of  
14 stepped bore 364 is sufficiently large to permit axial movement of  
15 the connector 354 over the nosepiece 362. A locking screw 372  
16 extends radially into the central portion 366 of the stepped bore  
17 364 of the connector 354 such that the screw 372 may be rotated to  
18 tighten against the block 358 to lock the connector 354 axially  
19 relative to the block. The proximal end 314 of the sheath 312  
20 extends through the nosepiece 362 and block 358 and is fixedly  
21 coupled in the proximal portion 368 of the stepped bore 364.  
22 Other aspects of the fourth embodiment are substantially as  
23 described above with respect to the first embodiment.

24

1 opening and closing functions. To that effect, a sliding spool  
2 assembly 428 for longitudinally moving the shaft 418 relative to  
3 the sheath 412 may be substantially rigidly fixed to the proximal  
4 end 438 of the body 430. For example, a distal end 462 of a  
5 stationary member 450 of the spool assembly 428 may be threadably  
6 mated with the proximal end 438 of the body 430. The spool  
7 assembly is preferably otherwise substantially as described with  
8 respect to proximal handle assembly 28 of the first embodiment of  
9 the invention.

10  
11 The resulting device is fixedly couplable relative to an  
12 endoscopic handle and provides to the physician the following  
13 controls: a means for controllably advancing, retracting, and  
14 setting the sheath of the snare instrument relative to the distal  
15 end of the endoscope; a means for advancing (opening) and  
16 retracting (closing) the snare relative to the distal end of the  
17 sheath; and a means for steering (rotating) the snare to position  
18 the snare over a polyp. Since the physician has direct and  
19 immediate control of the entire instrument, the snare instrument  
20 obviates the need for an assistant during the procedure, and  
21 improves the speed and efficiency of the procedure.

22

23 There have been described and illustrated herein several  
24 embodiments of a surgical snare instrument. While particular  
25 embodiments of the invention have been described, it is not

1 and the snare relative to the distal end of the sheath. Moreover,  
2 while a particular nosepiece has been described for use in the  
3 fourth and fifth embodiment, it will be appreciated that other  
4 nosepieces enabling stable coupling of the snare handle to an  
5 endoscope handle may be used. For example, a threaded connector  
6 capable of threading into or over a port on the endoscope handle  
7 may be used. Also, in the fourth and fifth embodiment, the mount  
8 and the body may be integrally formed or molded, and in the fifth  
9 embodiment, the body and the proximal sliding spool assembly may  
10 be integrally formed or molded. In addition, it will be  
11 appreciated that aspects of the various embodiments may be  
12 combined. For example, but not by way of limitation, the key of  
13 the second embodiment or the swivel joint of the third embodiment  
14 may be used in either of the fourth and fifth embodiments.  
15 Furthermore, the described handle assemblies may be used with  
16 other surgical instruments where both axial and rotational  
17 movement of a control member relative to a tubular member is  
18 required. For example, the handle may be used in laparoscopic and  
19 endoscopic instruments, generally, which include an end effector  
20 other than a snare loop. For example, and not by way of  
21 limitation, end effectors such as baskets and forceps may be used  
22 with the handle. It will therefore be appreciated by those  
23 skilled in the art that yet other modifications could be made to  
24 the provided invention without deviating from its spirit and scope  
25 as claimed.

4. A surgical instrument according to claim 1, wherein:

said first means is located distal said second means.

5. A surgical instrument according to claim 1, wherein:

said tubular member has proximal and distal ends, and

said first means is a first handle including a first member and including a second member provided with a bore, said second member being axially rotatable relative to said first member,

said first member having a distal end fixedly coupled to said proximal end of said sheath and a proximal end coupled to said distal end of said tubular member,

said shaft extending through said bore, and said second member having means for engaging said shaft such that rotation of said second member relative to first member causes rotation of said shaft relative to said sheath.

6. A surgical instrument according to claim 5, wherein:

said shaft includes a key portion provided with a non-circular cross section, and said means for engaging said shaft is a non-circular cross section of said bore of said second member adapted to engage said key portion.

11. A surgical instrument according to claim 1, wherein:

said shaft comprises a first element extending from said end effector to a location proximal said first means, and a second element extending from said location to said second member of said second means, said first and second elements being freely axially rotatable relative to each other.

12. A surgical instrument according to claim 11, wherein:

said first and second elements are coupled by a swivel joint.

13. A surgical instrument according to claim 11, wherein

said first element of said shaft is camber-free.

14. A surgical instrument according to claim 1, wherein:

said shaft is freely axially rotatable relative to said second means.

15. A surgical instrument according to claim 14, wherein:

said shaft is camber-free.

20. A surgical instrument according to claim 18, wherein:

said mounting means is adapted to adjustably fix said distal end of said sheath relative to a distal end of the endoscope.

21. A surgical instrument for insertion through an endoscope having a handle and a working channel, said surgical instrument comprising:

a) a elongate flexible tubular sheath having proximal and distal ends;

b) a flexible shaft extending through and axially movable relative to the sheath, said shaft having proximal and distal ends;

c) an end effector coupled to or formed at said distal end of said shaft, said end effector capable of being positioned in open and closed positions; and

d) a handle including coupling means for coupling said handle to the endoscope handle, and further including,

i) first means for longitudinally moving said sheath relative said working channel of the endoscope,

ii) second means for longitudinally moving said shaft relative to said sheath such that said end effector is movable between open and closed positions determined by relative positions of said sheath and said shaft, and

iii) third means for axially rotating said shaft relative to said sheath.



28. A surgical instrument according to claim 21, wherein:

said shaft is freely axially rotatable relative to said third means.

29. A surgical instrument according to claim 28, wherein:

said shaft is camber-free.

30. A surgical instrument according to claim 21, further comprising:

e) means for providing a cautery current to said shaft.

31. A surgical instrument for insertion through an endoscope having a handle and a working channel, said surgical instrument comprising:

a) a elongate flexible tubular sheath having proximal and distal ends;

b) a flexible shaft extending through and axially movable relative to the sheath, said shaft having proximal and distal ends;

c) an end effector coupled to or formed at said distal end of said shaft;

d) a first means for rotating said shaft relative to said sheath;

e) a second means for longitudinally moving said shaft relative to said sheath; and

36. A surgical instrument according to claim 31, wherein:

said first means is located distal said second means, and said shaft comprises a first element extending from said end effector to a location proximal said first means, and a second element extending from said location to said second means, said first and second elements being freely axially rotatable relative to each other.

37. A surgical instrument according to claim 36, wherein:

said first and second elements are coupled by a swivel joint.

38. A surgical instrument according to claim 36, wherein

said first element of said shaft is camber-free.

39. A surgical instrument according to claim 31, wherein:

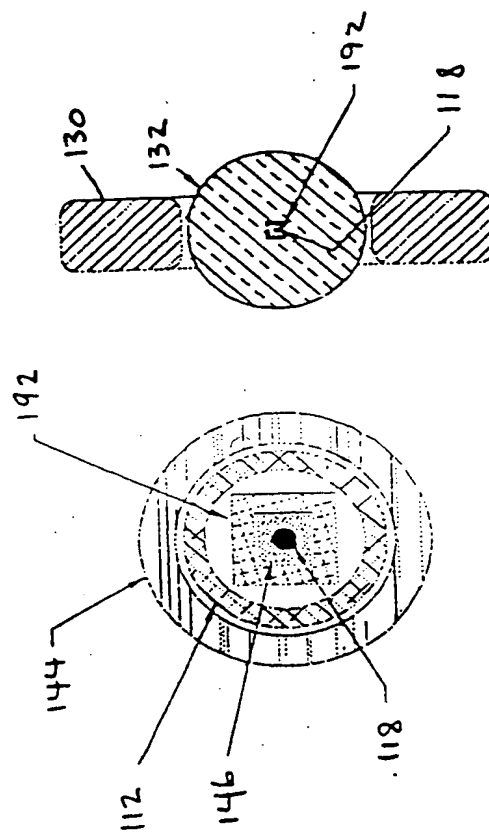
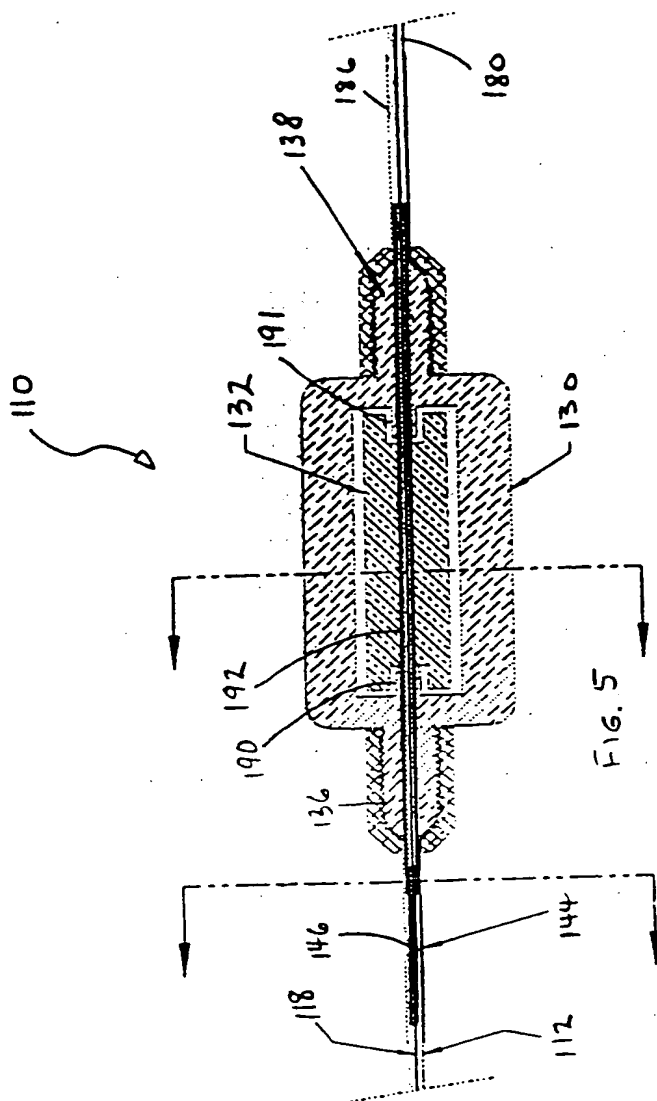
said shaft is freely axially rotatable relative to said second means.

40. A surgical instrument according to claim 39, wherein:

said shaft is camber-free.

41. A surgical instrument according to claim 31, further comprising:

e) means for providing a cautery current to said shaft.



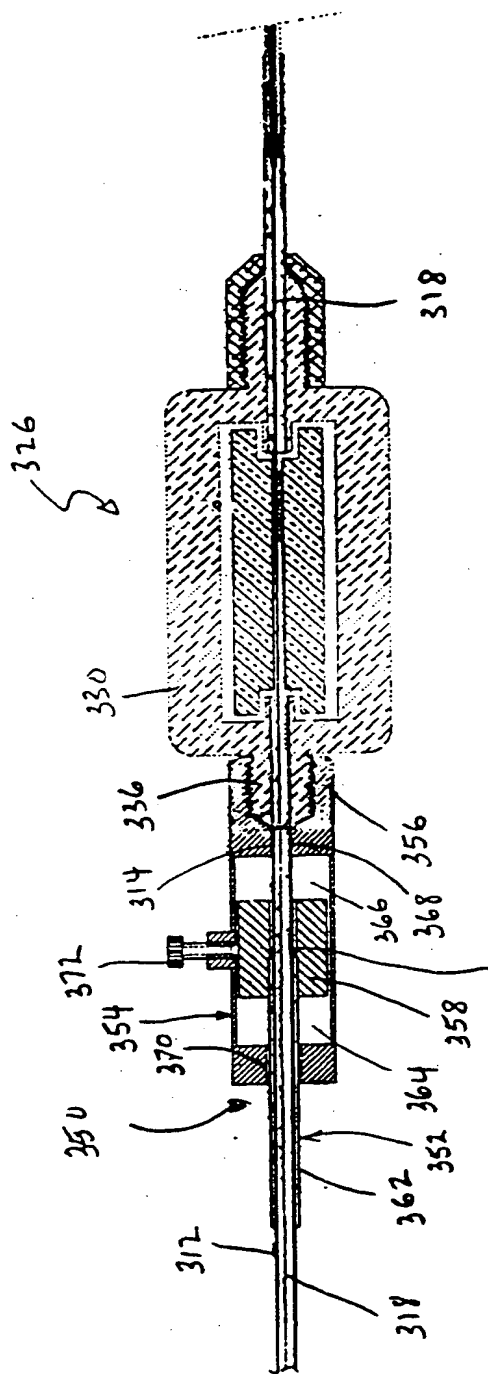


FIG. 10

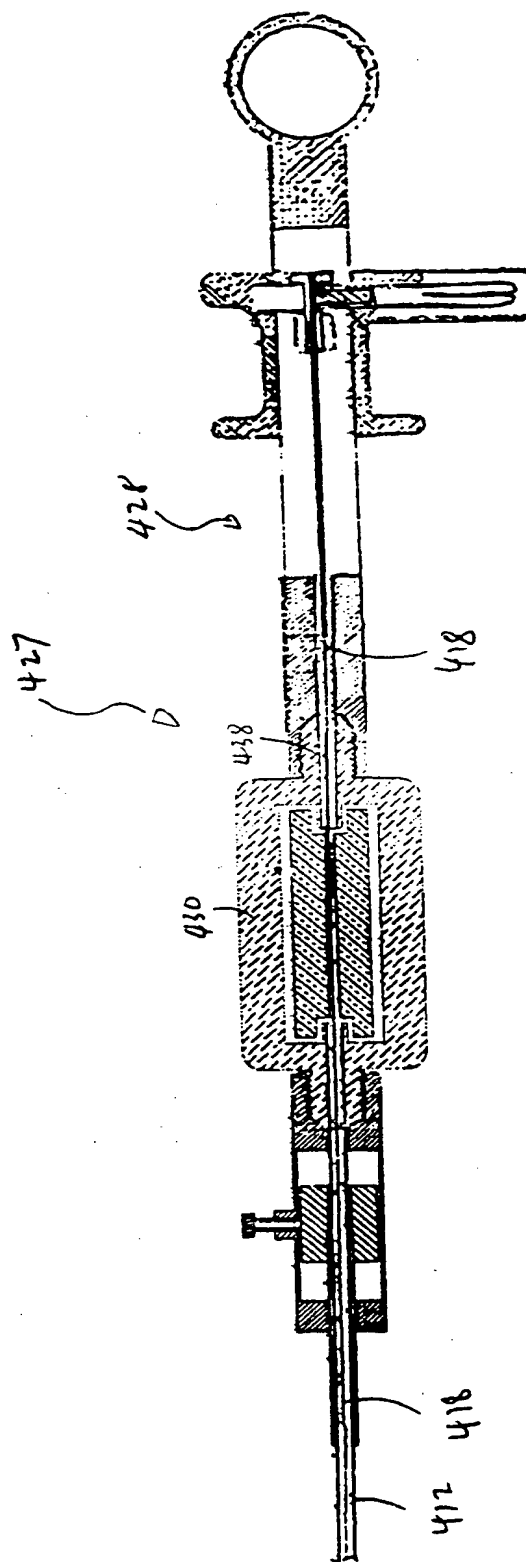


FIG. 11